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A new species of *Liolaemus* of the *bibroni* group from granitic ravines of Achiras, Sierra de Comechingones, Córdoba, Argentina (Reptilia: Tropiduridae)

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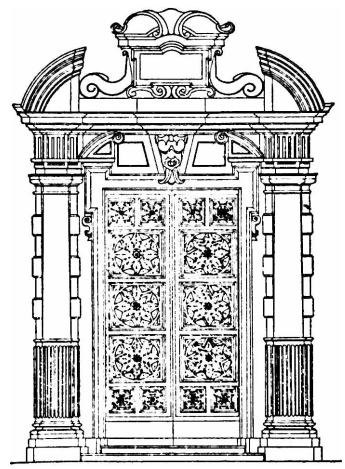

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ABSTRACT

A new species of the *Liolaemus bibroni* group from granitic ravines of Achiras, Sierra de Comechingones, Córdoba province, Argentina, is described. Morphological characters, sex dimorphism, patterns of coloration, and biogeographical data separate this new taxon from the other species of the group. A discriminant analysis of morphometric variables performed with three species of the *bibroni* group clearly differentiated the new taxon.

INTRODUCTION

In the course of field research in Sierra de Comechingones, we obtained specimens of an undescribed liolaemine lizard in stone hills near Achiras town, 65 km West of Rio Cuarto city, Córdoba province, Argentine Republic (Fig. 1).

The Sierra de Comechingones is the southernmost of the Sierras Grandes, from 32°00' to 33°00' south latitude, aproximately 130 km long. It was uplifted during Tertiary times (less 20 million years ago) but erosion has exposed a complex series of methamorphic and plutonic rocks of Precambrian age (Gordillo y Lencinas, 1979), giving rise to a complex of canyons, valleys, small high plains and peaks rocks such as the ravines near Achiras town.

A detailed examination of this new form suggests close relationships with the *Liolaemus bibroni* group, but it can be separated from all other known species of the genus by a combination of several characters.

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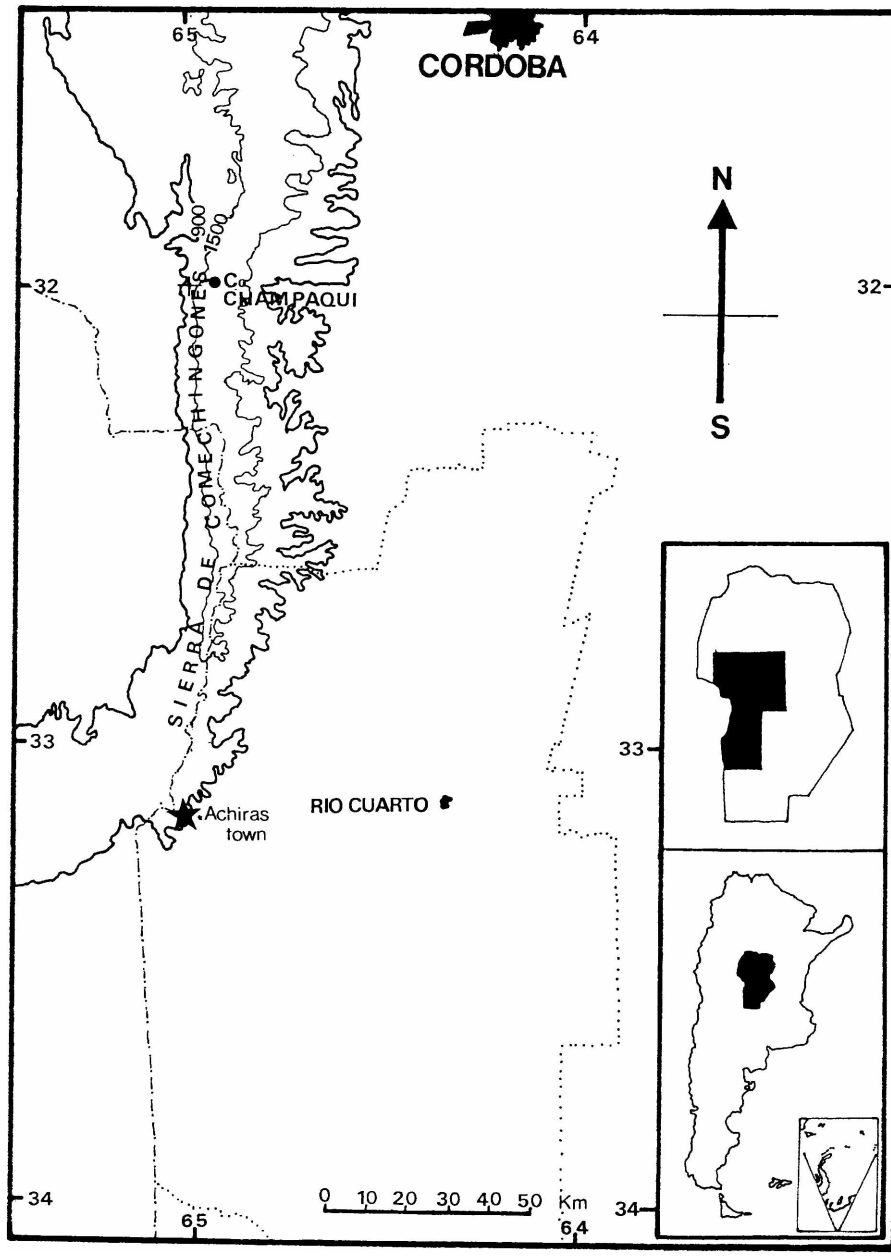

Figure 1 - Geographical localization of Sierra de Comechingones, Prov. Córdoba, Argentina. Black star: Type locality; Pointed line: limits of Rio Cuarto Department.

A description and identification of the new taxon of the genus is provided below with the name:

Liolaemus saxatilis sp. nov.

Holotype: Adult male. FML 02530. In uplifted rocks 5 km west of Achiras town (33°00' S., 64°54' W.), 1000 m, near Provincial Highway No. 1, Rio Cuarto Department, Córdoba Prov., Argentina. 12 November 1990. Coll. R. Martori and L. Avila.

Paratypes: UNRC-DCN-ZV 668, 1220, 1316, 1317-1620, 1322, 1370-1372, four males, seven females; FML 02531-02536, four males, two females; MRSN 101, 102.1, 102.2, 103.1-2, 104, two males, four females; MZUC 21090-21092, a male, two females; KU 217832, 217833, 217834, a male, two females. All with the same locality and data than the holotype.

Acronyms of the Herpetological Collections where specimens were deposited:

FML	- Fundación M. Lillo, Tucumán, Argentina;
UNRC-DCN-ZV	- Universidad Nacional de Rio Cuarto, Dep. Ciencias Nat., Zool. Vert.;
MRSN	- Museo Regionale di Scienze Naturali, Torino, Italy;
MZUC	- Museo de Zoologia, Universidad de Concepción, Chile;
KU	- Museum of Natural History, Univ. Kansas, Lawrence, USA.

Etimology: The Latin word *saxatilis* means "found among rocks".

Diagnosis

A *Liolaemus* lizard differing from other species of the *Liolaemus bibroni* group in the following characters: temporal scales strongly keeled in *L. saxatilis,* moderately keeled in *L. bibroni* and *L. fuscus* but smooth in *L. sanjuanensis;* cefalic scales wrinkled in *L. saxatilis,* smooth in *L. bibroni* and *L. sanjuanensis;* scales on anterior border of ear opening sharper in *L. saxatilis* than in *L. bibroni* and *L. sanjuanensis;* antehumeral folds strongly evident in *L. bibroni,* slightly evident in *L. sanjuanensis,* insignificant in *L. saxatilis;* antehumeral pockets small with moderate scales in *L. saxatilis,* larger with broader scales in *L. bibroni;* neck sligtly narrower in *L. saxatilis* than in *L. sanjuanensis,* remarkably narrower in *L. saxatilis* than in *L. bibroni.* The number of scales around midbody is smaller in *L. saxatilis* than in *L. sanjuanensis* and *L. bibroni.* The dorsal and ventral body scales are larger in *L. saxatilis* than in *L. bibroni, L. sanjuanensis* and *L. fuscus;* dorsal body scales are slightly smaller than ventrals in *L. bibroni,* equal or subequal in *L. saxatilis, L. sanjuanensis* and *L. fuscus.* The color pattern is distinctly different in the four species.

DESCRIPTION OF THE HOLOTYPE

Body stout but elongated, slender, with moderate hind leg that exceeds the axilla (fourth toe of hind limb surpassing axilla); fourth finger of forelimb not reaching tip of snout. Head about 1/5 body length and tail, autotomic, twice longer than snout-vent length. Rostral more than twice as wide as high. Nasal rounded, elongated, opened laterally and posteriorly, in contact with rostral scale anteriorly and separated from first supralabial scale by a small and triangular or slightly rectangular scale. Two cuadrangular internasal and two cuadrangular prefrontal scales; three frontonasals, two of them cuadrangular and symmetrically arranged, being the middle scale rhomboidal.

A frontal scale and two smaller postfrontal or frontoparietal scales; supraorbital semicircle distinct; three enlarged supraoculars, medianly contacting supraorbital semicircles, laterally separated from superciliaries by a row of scales, smaller and irregular. Interparietal scales slightly smaller than parietals; parietal eye small but visible.

Scales of parietal and upper temporal region smaller than parietals, irregular, strongly keeled. Six superciliary scales elongate and superposed. A large subocular scale, concave and separated from supralabials by two enlarged scales, subocular in contact posteriorly with the fourth supralabial scale.

Temporal and nuchal scales keeled, moderately sized and slightly rough. Ear opening transverse, ovoid, with prominent projecting scales anteriorly and small granular scales posteriorly. Six supralabial scales, smooth and cuadrangular, enlarged; mental scale more than twice as wide as high; two equal postmentals, next following scales cuadrangular and enlarged; the others equal to gular scales. Lateral gulars slightly enlarged; the others, gulars or throath scales, small, smooth and imbricated. No gular fold. Scales on the sides of neck small, keeled and acuminate, arranged in regular rows. Dorsal and dorsolateral body scales acuminate, distinctly keeled, imbricate, smooth and regularly arranged, equal or subequal to ventrals. Proximal caudal scales, anterior to the first autotomy segment, dorsally similar to the trunk scales: rhomboidal and smooth below. Distal caudal scales squarish, diagonally keeled above and below. Upper limb scales keeled, imbricate; ventral limb scales smooth, imbricate; thigh bordered by a row of enlarged scales, finely granular posteriorly. Supracarpal and supradigital scales slightly keeled or smooth; supratarsals and supradigitals keeled. These scales are imbricate and acuminate.

Scales around midbody 39, 20 tricarinate lamellae under fourth toe and 19 tricarinate lamellae under fourth finger of right side, 3 preanal orange pores, 10-11 mid-dorsal or dorsolateral scales contained in the head length. Measurements in mm: snoutvent length: 54, total length: 144, head length: 10.5, head width: 9.2, foreleg: 32, hindleg: 19.3, axilla-groin distance: 23.7.

Colour in life (Figs. 2 and 3): dorsally grayish-brown with two dorsolateral

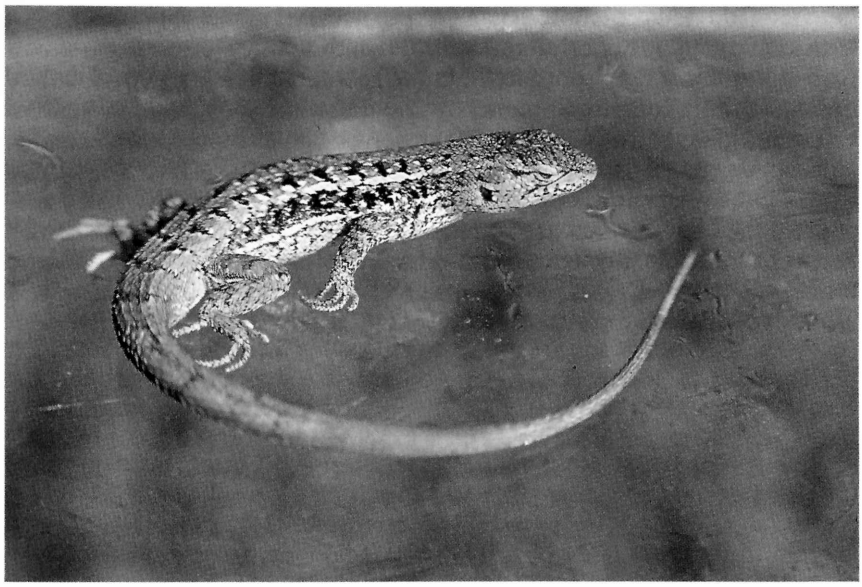

Figure 2 - A male (no holotype) of *Liolaemus saxatilis* from Achiras ravines, southernmost counterfort of Sierra de Comechingones, Córdoba province.

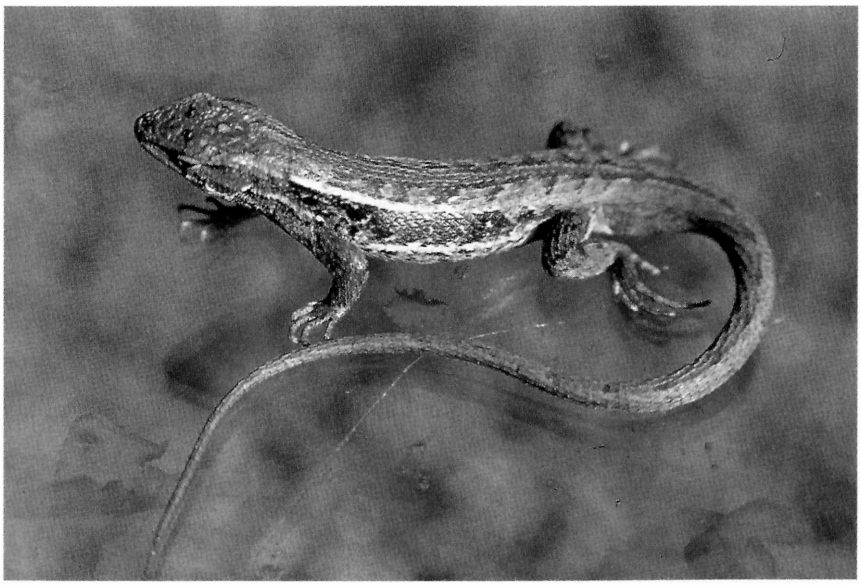

Figure 3 - A female of *Liolaemus saxatilis*: same locality.

longitudinal bands composed by eleven transversal marks with upper black triangular spots posteriorly bordered by whitish, more extended frontally such as semilunar light spots, fused in the posthumeral region, and followed by larger lower spots also bordered by rounded white spots fused in a almost continuous line in the holotype. The upper triangular spots continue on the tail fusioning in the distal part, the lower dorsolateral blackish spots dissapearing on the lateral surface of the tail. Ventrally whitish with fine chromatophore punctuation which accentuates on the throat. Head darker than the dorsal ground, laterally lighter with diminute black spots. Dorsal surface of forelegs and hindlegs grayish-brown with transverse confused dark bands. In preservative liquid: the same coloration but attenuated.

Variation in paratypes

Snout-vent length (minimum, mean ± standard error, maximum): 42 (51.14 ± 0.74) 59.5; head length: 8.9 (9.86 ± 0.12) 11; head width: 7.2 (8.58 ± 0.13) 9.7; foreleg: 14.7 (16.81 ± 0.17) 18.5; hindleg: 24.2 (27.83 ± 0.32) 31.8; axilla-groin distance: 18.6 (24.75 ± 0.59) 32.7. Midbody scales in males: 38-43; midbody scales in females: 37-44.

In males the general colour is similar to the holotype but sometimes transversal marks do not cut the longitudinal dorsolateral lines. In some specimens the transversal bands may be reduced to dorsal spots that can be triangular, rectangular or irregular. In some males the ventral and lateral side of the head and neck, the ventral side of thigh and the precloacal area are yellow or bright orange; the anal pores are bright orange. The female dorsal pattern exhibits the same coloration of the males, but the colours are fainter. Longitudinal dorsolateral lines are pale brown or ochre; as well as in males, in females the tranversal marks do no cut the longitudinal dorsolateral lines; only black triangular, cuadrangular or irregular spots are present on the longitudinal dorsolateral lines. No distinctive sex-coloration is present in females.

Range

Known only for the type locality: probably it extends its distribution to Champaquí mountain, 130 km northwards.

General ecological and biogeographical considerations

Our finding of this new species may contribute to a better understanding of the biogeographic vicissitudes and features of the Sierras pampeanas. We can assume that the origin of *L. saxatilis* could be related to the last Glaciation

(Cei, 1980, 1982), when it was probably isolated from its most similar species *L. sanjuanensis,* endemic in the Sierra Pie de Paolo, San Juan province, and from *L. bibroni* widely distributed from the Patagonian province of Santa Cruz to the northern Mendoza Andean districts, above 2000 m (Cei, 1973). All these species appear related to *L. fuscus* from Chile, likely suggesting a primitive pattern of distribution prior to the events of the Andean orogenesis, when impressive conditions of geographic isolation in the Precordillera and Sierras Pampeanas arose.

The area where *L. saxatilis* was collected (Fig. 4) has been indicated phytogeographically by Bianco *et al.* (1987) as foot hill of the Sierra de Comechingones with prevailing vegetation types as mountain steppe (Pampas de altura) and associations of shrubs, weeds and trees (bosque serrano y romerillar) representing a somewhat extreme and impoverished area of the Chacoan region.

The herpetological community of such a area is composed by *Teius oculatus, Cnemidophorus lacertoides, Tupinambis teguixin* (Fam. Teiidae), *Homonota horrida, H. whitii* (Fam. Gekkonidae), *Mabuya dorsivittata* (Fam. Scincidae), *Bothrops neuwiedii, B. alternatus* (Crotalidae), *Micrurus pyrrocryptus* (Fam. Elapidae), *Liophis poecilogyrus, Pseudotomodon trigonatus* (Fam. Colubridae) and *Leptotyphlops australis* (Fam. Leptotyphlopidae).

Figure 4 - Habitat of *Liolaemus saxatilis:* ravines 5 km west of Achiras Town, at about 1000 m (Department of Rio Cuarto, Córdoba province).

L. saxatilis is frequently seen foraging and basking on large rocks and in grass patches near them. Its activity period is variable depending on temperature but specimens are frequently seen from 10:00 to 19:00 hs, from September to March. These lizards are insectivorous and oviparous with clutch size from four to six eggs, white and ovoids (1.2 mm x 0.8 mm).

This new species is clearly differentiated from the other species of the group, *L. bibroni* (Bell), *L. fuscus* (Boulenger) and *L. sanjuanensis* Cei. The chromatic patterns allows separation of all of these species; the dark vertebral line present in *L. bibroni* is not present in the other species and, as *L. sanjuanensis, L. saxatilis* presents sexual chromatic dimorphism. The number of preanal pores in *L. saxatilis* (3-5) is intermediate between *L. sanjuanensis* (5-6) and *L. bibroni* and *L. fuscus* (2-4). *L. saxatilis* is a medium sized lizard, smaller than *L. sanjuanensis* but larger than the other species of the group. Snout-vent measurements in mm taken in males are (minimum, mean ± SD, maximum): 38 (49.81 ± 5.58) 59.5 in 14 *saxatilis,* 58 (58.60 ± 1.34) 61 in 5 *sanjuanensis,* 35.4 (44.40 ± 3.93) 51.0 in 65 *fuscus* and 45 (53.6 ± 4.03) 61 in 48 *bibroni;* in females 45 (51.66 ± 3.35) 57 in 16 *saxatilis,* 56 (59.58 ± 2.69) 64 in 6 *sanjuanensis,* 35.2 (42.28 ± 2.97) 47.6 in 49 *fuscus* and 46.0 (51.95 ± 3.62) 60 in 43 *bibroni.* That character is significantly dissimilar in all of these species at a $P < 0.01$ (Student-Fisher test) excepted between females of *L. bibroni* and *L. saxatilis.* The snout-vent length/head length ratio and the snout-vent length/axilla - groin distance ratio show a significant sexual dimorphism in *L. saxatilis* ($P < 0.01$ and $P < 0.001$, Student-Fisher Test).

Table I - Comparative mensurable characters in three species of the *Liolaemus bibroni* group (in mm): means and standard deviations (in parentesis).

Group	1	2	3	4	5	6
N	16	14	6	5	9	10
SVL	51.66(3.35)	49.81(5.58)	59.83(2.78)	58.60(1.34)	47.20(6.11)	53.73(5.64)
HL	08.41(0.66)	08.72(5.58)	11.66(0.60)	13.00(0.00)	08.96(0.54)	10.17(0.83)
HW	09.68(0.60)	10.00(0.80)	09.41(0.37)	11.10(0.41)	08.18(0.73)	09.46(1.13)
FLL	27.13(1.42)	28.67(2.24)	28.50(1.09)	31.70(0.83)	25.51(2.30)	28.69(2.42)
HLL	16.74(1.02)	16.72(1.39)	18.91(1.06)	20.40(0.89)	15.62(1.48)	17.46(1.29)
AGD	26.08(2.89)	22.66(2.86)	30.75(2.65)	28.40(1.19)	23.51(3.01)	24.53(2.52)

See text for symbols of the variables: 1-2, *L. sanjuanensis;* 3-4, *L. bibroni;* 5-6, *L. saxatilis* (1,3 and 5 males; 2,4 and 6 females).

MORPHOMETRIC ANALYSIS AND COMPARISON WITH SPECIES OF THE SAME GROUP

A multivariate analysis of six morphometric characters was carried out to discriminate the different taxa of the *bibroni* group, using three species of the group (data for *L. fuscus* were not available): 30 *L. saxatilis* (16 females + 14 males), 19 *L. bibroni* (9 females + 10 males) and 11 types and paratypes of *L. sanjuanensis* (6 females + 5 males). Characters used were: SVL (snout-vent length), HL (head length), HW (head width), FLL (forelimb length), HLL (hindlimb length) and AGD (axilla-groin distance) (Cfr. Table I).

Comparing the medium values of each group (group = species, by sex), a multivariate analysis of variance (Manova: Manly, 1986) provided significant differences ($P < 0.001$) for the six variables pooled. The classification of the

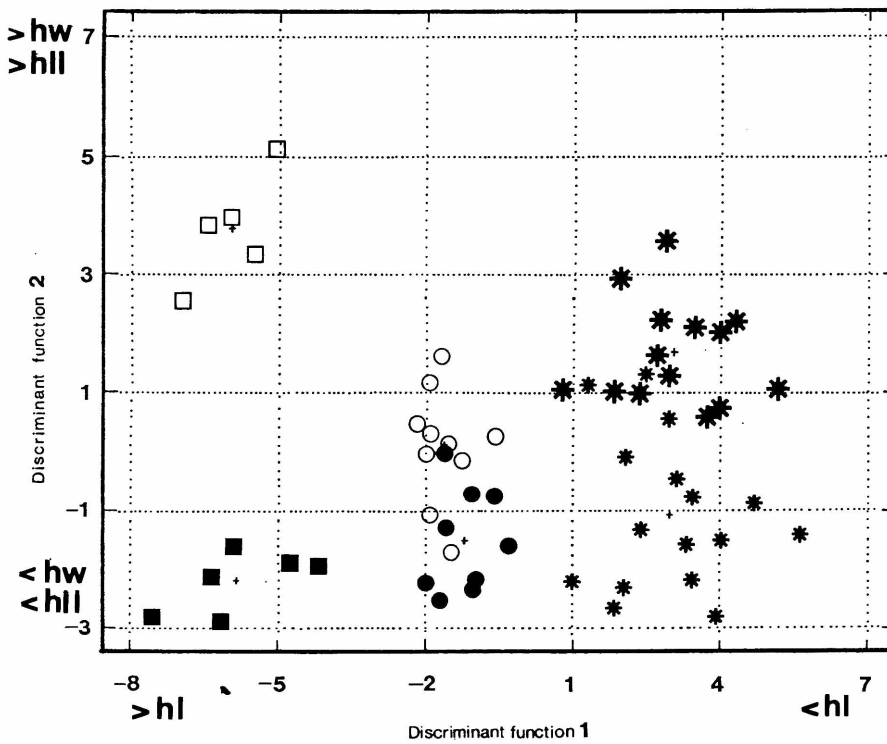

Figure 5 - Plot of 60 specimens of three species of the *Liolaemus bibroni* group showing their values for two discriminant functions. White cuadrangulars: males of *L. sanjuanensis;* black cuadrangulars: females of *L. sanjuanensis;* white circles: males of *L. bibroni;* black circles: females of *L. bibroni;* large asterisks: males of *L. saxatilis;* small asterisks: females of *L. saxatilis.* (For variables and functions see *Morphometric analysis and comparison with species of the same group,* in the text).

specimens and the individual relationships were the purpose of such a numerical analysis. The analysis provided two significative functions ($P < 0.001$) absorbing the 92.7% of the variation. In Fig. 5, when the individual values are plotted, the first function discriminates the species and the second the sexes. This last function clearly separates sexes in *L. sanjuanensis* and with some overlapping *L. bibroni* and *L. saxatilis*. The first function is negatively correlated (Pearson correlation test) with the HL ($r = -0.87$, $P < 0.001$) and the second is positively correlated with HW ($r = 0.62$, $P < 0.001$) and HLL ($r = 0.59$, $P < 0.001$). It means that the best variable that separates the species is HL which decreases from *sanjuanensis* to *saxatilis*. In the meanwhile to separate sexes the high values of HW and HLL belong to the males.

For the purpose of classification of the groups only 6 of the 60 individuals were assigned to incorrect sex (in *saxatilis* and *bibroni*): moreover no mistakes occur between species. The analysis indicates a larger morphological distance between *L. sanjuanensis* and *L. saxatilis* than between *L. saxatilis* and *L. bibroni,* occupying an intermediate position. However, results of morphometric variables do not agree with the scale counts, which indicate that *L. saxatilis* is more similar to *L. sanjuanensis* than to the other species of the group. These results, as well as the biogeographical data, may suggest a probable high evolutionary divergence between the three species analyzed.

ACKNOWLEDGMENTS

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RIASSUNTO

Si descrive una nuova specie di iguanideo tropidurino, *Liolaemus saxatilis,* del gruppo *bibroni,* raccolto nei rilievi rocciosi a 5 km a Nord di Achiras (Departamento Rio Cuarto, Prov. Córdoba, Argentina). Caratteri morfologici, dimorfismo sessuale, colorazione e dati biogeografici permettono di distinguere questo nuovo taxon dalle altre specie del gruppo; anche l'analisi multivariata dei suoi caratteri morfometrici conferma tale separazione.

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